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(54) Title: OPTIMIZED EXPRESSION OF HPV 31 L1 IN YEAST

(57) Abstract: Synthetic DNA molecules encoding the HPV31 L1 protein are provided. Specifically, the present invention provides polynucleotides encoding HPV31 L1 protein, wherein said polynucleotides are free from internal transcription termination signals that are recognized by yeast. Also provided are synthetic polynucleotides encoding HPV31 L1 wherein the polynucleotides have been codon-optimized for high level expression in a yeast cell. The synthetic molecules may be used to produce HPV31 virus-like particles (VLPs), and to produce vaccines and pharmaceutical compositions comprising the HPV31 VLPs. The vaccines of the present invention provide effective immunoprophylaxis against papillomavirus infection through neutralizing antibody and cell-mediated immunity.

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/08677

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C12P 21/06

US CL : 435/69.1

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 435/69.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01/14416 A2 (MERCK & CO., INC) 01 March 2001, see the abstract.	1-43
A	US 5,821,087 A (LOWE et al) 13 October 1998 (13.10.1998), abstract.	1-43
A	WO 00/09157 A1 (MERCK & Co. INC.) 24 February 2000 (24.02.2000), abstarct.	1-43

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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**INTERNATIONAL SEARCH REPORT**

PCT/US04/08677

**Continuation of B. FIELDS SEARCHED Item 3:**

WEST, DERWENT, EPA, JPA, CAPLUS, BIOSIS, MEDLINE, NPL

search terms: Papilloma virus, HPV?, codon optimized, yeast, vector, vaccine, CTL